ENVIRONMENTAL ASSESSMENT

AND

SECTION 404 EVALUATION

FOR

MAINTENANCE DREDGING

NORWALK HARBOR

NORWALK, CONNECTICUT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

OCTOBER 1979

SUMMARY

It is the responsibility of the Corps of Engineers, New England Division, to maintain the Federally authorized Navigation Channel in Norwalk Harbor, Norwalk, Connecticut. It is also the responsibility of the Corps, in accordance with the National Environmental Policy Act and the Water Pollution Control Act, to investigate and present those effects associated with the project that impact the human environment and water resources -- and, where possible, minimize detrimental impacts. Various concerns regarding such impacts have resulted in the Corps proposing the project as described in this assessment to avoid more unacceptable environmental impacts, yet accomplish the critically needed maintenance of the navigation channel.

This final project design is the result of intensive efforts by Federal and State concerns to determine an appropriate methodology for management of disposal activity at the project. This plan has been designed to minimize adverse environmental effects to the aquatic ecosystem.

It is my conclusion that impacts and objectives of concern have been clearly identified in this assessment and considered in the project specifications. The proposed disposal method has been determined, within institutional, economic, and engineering constraints, to be the most suitable alternative to accomplish maintenance of this navigation project.

5 October 1979
DATE

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

TABLE OF CONTENTS

NORWALK HARBOR

PREFACE

This assessment discusses the need for and the environmental impacts of the proposed maintenance dredging at the Federal navigation project at Norwalk Harbor, Connecticut. This action will involve the mechanical removal of approximately 300,000 cubic yards of shoal material from the Federal channel and anchorages and the burial of approximately 2,000 cubic yards of contaminated material from the channel. The noncontaminated material will be disposed of at the Central Long Island Sound Disposal Area and the contaminated material will be buried beneath the Federal channel.

The assessment examines the possible environmental impacts which might result from the project. Major areas of concern are covered including: impacts of suspended material; uptake of contaminants; and impacts of disposal at the Central Long Island Disposal Area. All land-based disposal alternatives are described but particular attention is devoted to the selected disposal solution.

PROJECT DESCRIPTION

The Problem

The channel and anchorage at Norwalk Harbor has not been maintained since 1971; its adequacy for navigation is severely restricted. The inner harbor can only accommodate one commercial vessel at a time, and fully loaded vessels can only make use of the channel during high tide. In winter when ice forms in the channel, navigation is impossible. There is a continual possibility of grounding, vessel damage and oil spills in the harbor due to shoaling. Maintenance dredging will restore the channel to its authorized dimensions thereby providing adequate navigation conditions and increasing safety.

Purpose and Need for Proposed Action

The Corps is proposing to maintenance dredge the Federal navigation project in Norwalk Harbor, Norwalk, Connecticut (see Figure 1). Surveys of the project show the need to remove approximately 300,000 cubic yards of sediment. All but 2,000 cubic yards of the sediments will be dredged by a clamshell barge and transported by scow to the Central Long Island Sound Disposal Area (see Figure 2). The Central Long Island Sound Disposal Area is the closest open water disposal site to Norwalk Harbor. This

area is one of the four areas which the states of New York and Connecticut include in their proposed Interim Plan for the Disposal of Dredged Materials in Long Island Sound. This area has been identified as a "containment" site because the site is sufficiently deep to reduce the probability of scouring. Tidal and wind generated currents are too weak to disperse the spoils, and natural bottom sediments are predominantly silts and clay sized particles. The states consider about 4 percent of the Norwalk Harbor material to be "degrading" and unacceptable for open water disposal unless other "nondegrading" material from the harbor is placed over it as a protective blanket. Dredging would begin in December 1979 and be completed by November 1980. No work would be done between 1 June and 1 October to avoid potential impacts to spawning and larval shellfish.

The dredged material will be point dumped at a buoy located at 41° 08′ 50"N, 72° 53′ 25"W. The use of this point will not interfere with monitoring of the capping operation at the Stamford-New Haven disposal sites. Scows carrying dredged material to the disposal site will leave the harbor area through the approach channel of the Federal navigation project to preclude any possibility of inadvertent loss of dredged material in commercial oyster beds. Disposal operations will be controlled by Federal inspectors using precision navigation.

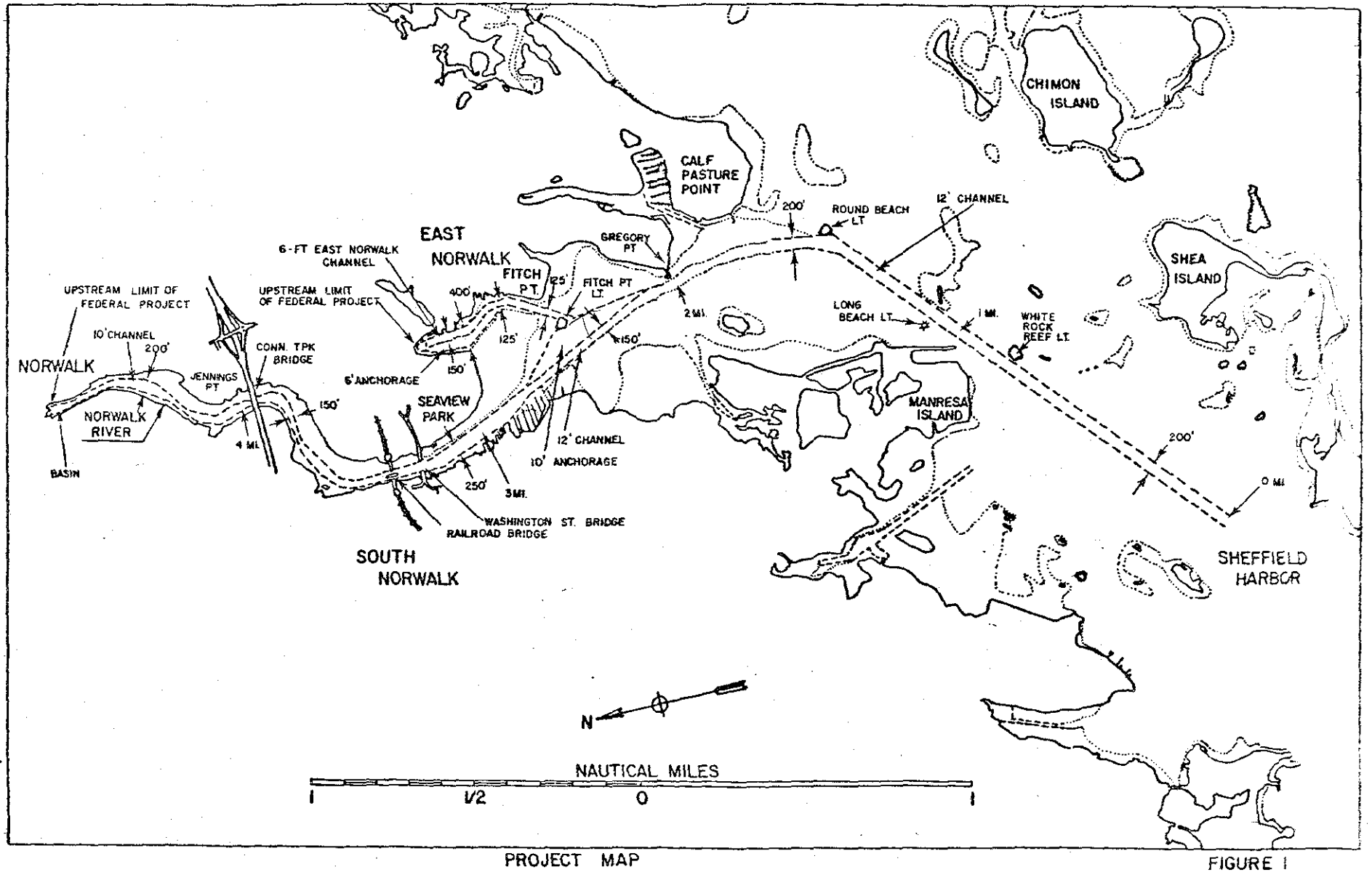
The 2,000 cubic yards not slated for disposal in Long Island Sound are contaminated with naphthalene and nitrobenzene; this material will be given special handling. The contaminated material will be placed in a deep excavation below the Federal channel and covered with at least five feet of overburden. This will isolate these chemicals from the ecosystem and will also keep the material under the Corps jurisdiction. Consequently, the material will remain undisturbed.

Specific Action Description

As authorized, the project consists of four segments, and provides for:

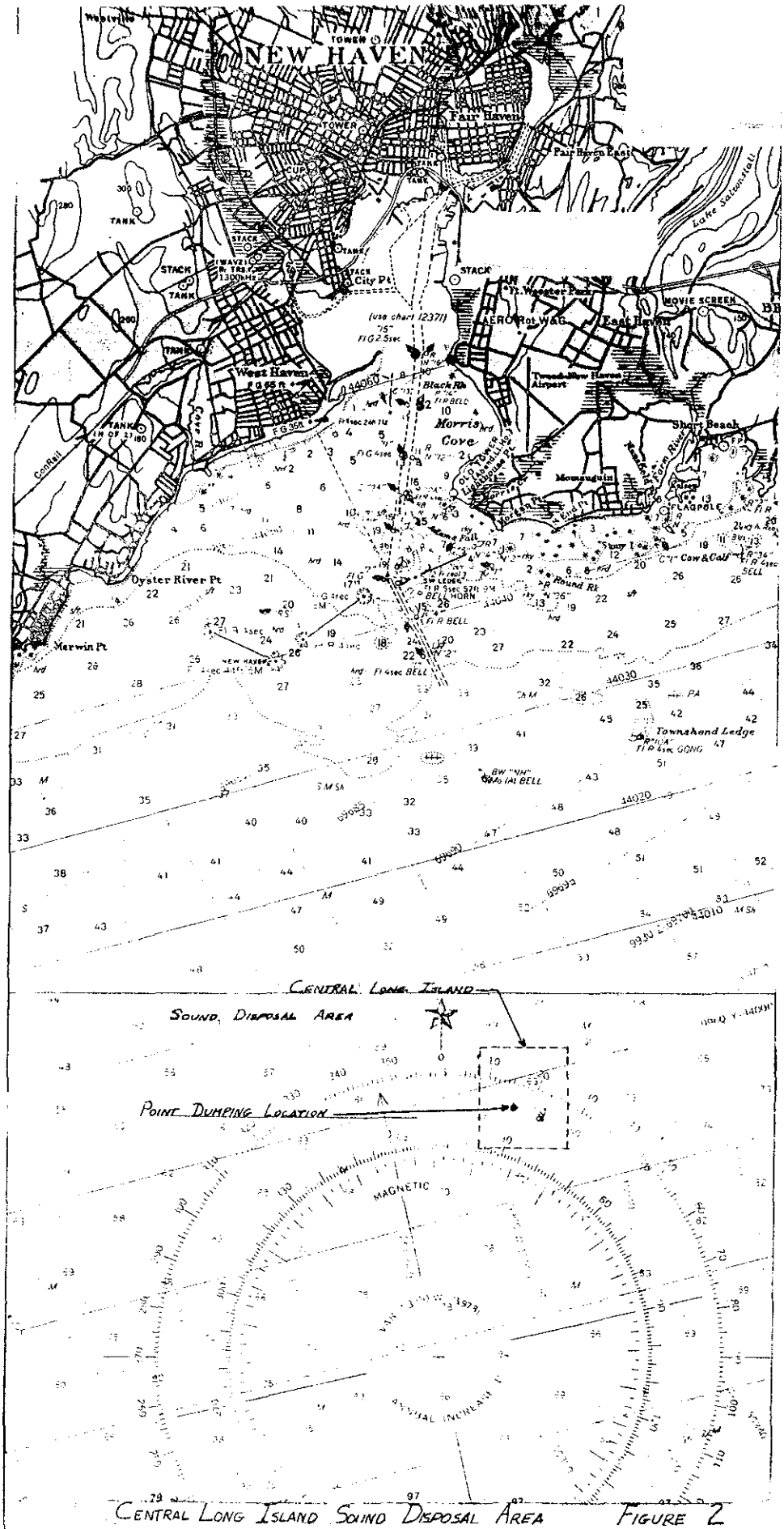
1. A channel 12 feet deep, 200 feet wide from Outer Harbor to Gregory (Dorlon) Point, then 12 feet deep, 150 feet wide to South Norwalk and 250 feet wide along the wharves to Washington Street Bridge about 3.2 miles in length, then 10 feet deep, generally 100 feet wide to a basin at the head of navigation at Norwalk, a length of about 1.5 miles.

2. An anchorage basin 10 feet deep and about 17 acres opposite Fitch Point.



PROJECT MAP

FIGURE 1



CENTRAL LONG ISLAND SOUND DISPOSAL AREA FIGURE 2

3. A channel 6 feet deep, 125 to 150 feet wide, along the east side of the harbor to the head of navigation at East Norwalk. The length of this section is about 0.6 miles.

4. An anchorage basin 6 feet deep, adjacent to the upper portion of the East Norwalk Channel.

ENVIRONMENTAL SETTING

Harbor Community

Norwalk Harbor is located in the southern region of Connecticut on the north shore of Long Island Sound. It is 13 miles southwest of Bridgeport Harbor, and 41 miles east of New York City.

The outer harbor, also known as Sheffield Island Harbor, and the tidal portion of the Norwalk River comprise Norwalk Harbor. From the mouth of the harbor to the wharves at South Norwalk, the estuary is generally 0.5 miles wide, decreasing in width to about 140 yards at South Norwalk, above which it narrows to 50 yards at Norwalk, as it winds through shallow flats and marshes to a small basin at the wharves in Norwalk. Natural depth in the greater part of the harbor is not more than 2 feet at mean low water, although near the mouth at Gregory Point the depths range from 13 to 25 feet. Mean tidal range in the harbor is 7.1 feet, and the spring range is 8.4 feet.

Deep draft traffic in the harbor is primarily for shipments of petroleum. During 1975, 2,720 (inbound and outbound) trips by vessels with drafts up to 17 feet were recorded. These vessels carried 847,490 short tons of petroleum, sand and gravel. Partially due to shoaling, commercial vessel tonnage had dropped to 822,908 short tons in 1977, the latest figures available.

The harbor also accommodates a substantial recreational fleet. Over 2,600 pleasure boats with drafts up to 9 feet are based at the harbor's 8 yacht clubs and 14 marinas. Each weekend during the boating season some 500 boats use the launching ramps. In addition, about 5,000 transient craft visit Norwalk Harbor annually. These boats come from various areas within Long Island Sound and along the east coast.

Vegetation

A major portion of the land surrounding the harbor is extensively developed; therefore little of the natural vegetation remains. But scattered around the rim of the harbor are typical

tidal wetland plants; such as Spartina spp., Juncus spp., and Salicornia spp. The location of these wetlands can be found in Figure 3.

Aquatic Life

Two studies have been conducted on the aquatic life found in Norwalk Harbor (Loosanoff, 1961, 1965). In general, the portion of the harbor above I-95 is in poor condition. The chief reason for this may be historic discharges of toxic organic chemicals. The dissolved oxygen found in the water can vary markedly; one study showed values of 0.0 to 2.8 mg/l. Consequently, there are areas north of I-95 which are devoid of life, but in some areas marine worms and clams are found.

From I-95 to the Sound, the condition of the harbor sediment progressively improves. The immediate area below the bridge is stressed, as evidenced by the small number and types of species present, but shows marked improvement. The trend continues to the outer harbor. Extensive beds of commercial hard shell clams and oysters are found in the outer harbor; the Connecticut Department of Environmental Protection considers these beds commercially valuable (see Figure 4).

POSSIBLE IMPACTS OF THE PROPOSED ACTION ON THE ENVIRONMENT

There are possible impacts associated with the proposed dredging and disposal of the Norwalk Harbor sediments such as the following:

1. The impacts of suspended material on oysters, hard shell clams, and other organisms;

2. The uptake of contaminants at the dredge and disposal site;

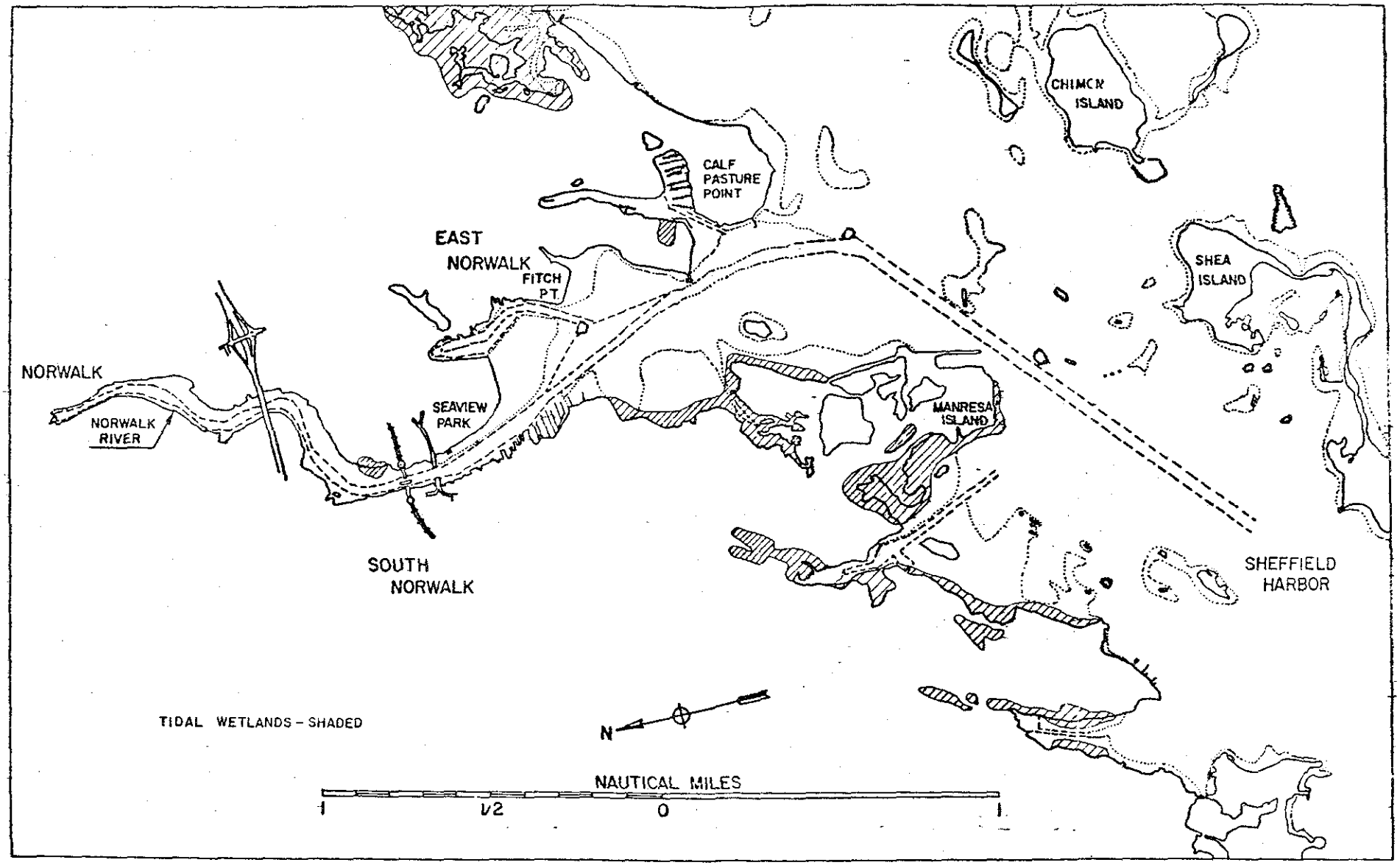
3. The impact of dredging and disposal of a small quantity of sediment containing nitrobenzene and naphthalene; and

4. The impacts of disposal in Long Island Sound.

Each of these impacts will be discussed in the following paragraphs.

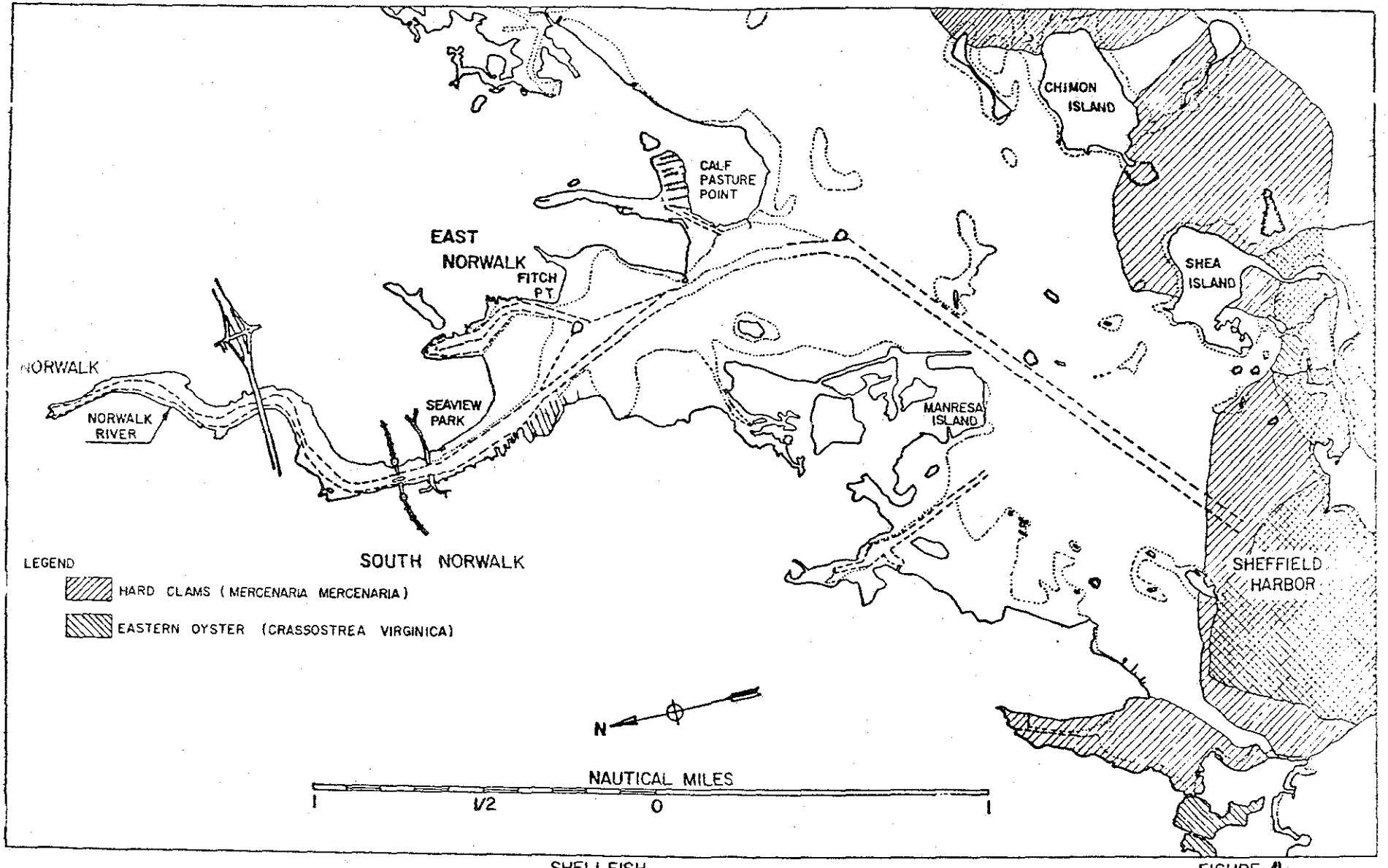
Suspended Material

As stated in the environmental setting section, the outer portion of the harbor has extensive beds of shellfish. Dredging



TIDAL WETLANDS

FIGURE 3



SHELLFISH

FIGURE 4

would release materials into the water; and if sufficient amounts of the suspended material were present, shellfish could be adversely impacted. Potential impacts due to suspended material would depend on the amount of material dredging would release and the amount of suspended material that adversely impacts oysters and hard shell clams.

Studies have been conducted on the release of sediments into water during dredging (Wakeman, et al, 1973; Barnard, 1978; Bobuniewicz, et al, 1974). The releases vary depending upon a number of factors, the major ones being sediment particles size, currents in the area, and the type and size of the dredge. A clamshell or bucket dredge creates suspended solid loads generally no greater than 500 mg/l (500 ppm), and averaging around 100 mg/l (100 ppm).

The amount of suspended material necessary to adversely impact adult oysters and hard shell clams has been studied extensively (Lunz, 1938; Wilson, 1950; Ingle, 1952; Mackin, 1956 and 1962; Loosanoff, 1961 and 1965). In one of these studies, oysters lived and fed in water containing up to 700 mg/l of suspended material with no adverse impact. Hardshell clams appear to be even more resistant to turbidity than oysters. Consequently, adult shellfish should not be harmed by suspended loads even immediately adjacent to the dredging site. Dredging will not be accomplished during spawning and larval periods of the shellfish to avoid any potential impacts to immature shellfish. As for other organisms subjected to turbidity, studies have shown that estuaries are dynamic and substantial amounts of turbidity can be naturally generated (Aston, et al, 1976; Oviatt), consequently, other organisms present should already be acclimated to increased levels of suspended materials. In addition, since dredging induced turbidity is transitory (Windom, 1973) there should be no significant impact to the ecosystem.

Uptake of Contaminants

Estuarine sediments can contain elevated levels of contaminants caused by man or by natural condition. Man, as the ultimate consumer of many species, could be adversely affected by these contaminants if they accumulated in marine organisms. There are three sources from which organisms may uptake contaminants: food, the surrounding environment, i.e., air, water, and sediments, or a combination of the two sources. The passing of substances from one organism to another is known as biomagnification or bioamplification. This section will address the biomagnification of the heavy metals, PCB's and DDT's and petroleum hydrocarbons associated with dredging.

- Heavy Metals

The discovery of generally higher concentrations of mercury in the muscles of large predatory fish, such as tuna and swordfish, rather than in the muscles of fish and other organisms at lower trophic levels leads to the theory that bioamplification occurs along the food chain. However, it appears that the higher concentrations are not so much a function of trophic level but of time. Tuna and swordfish both live for relatively long periods and are very large; this is the reason they have elevated levels of mercury (Cross, et al, 1973).

Except where age and size seem to be significant factors in accumulating mercury, little evidence exists of bioamplification taking place. This has been confirmed by analysis of organisms at different trophic levels for mercury and other metals (Knauer, et al, 1972; Cocoros, et al, 1973; Leatherland, et al, 1973; Williams, et al, 1973). Further, experimental studies tend to confirm that there is no clear relationship between heavy metal concentrations and food chain position (Hannerz, 1968; Laumond, et al, 1973; Jernelov, et al, 1971; Aubert, et al, 1973). Scientific study seems to indicate that food chain transfers do not really occur.

The greater concentration of metals in aquatic organisms is chiefly a physical phenomenon (Stickel, 1974) that is, most organisms seem to incorporate metals from solution. For example, in Minamata Bay, Japan, where many people were affected by mercury poisoning, the concentration present in organisms seemed to follow the output of mercury and methyl mercury from two industrial plants; not the concentrations accumulated in the sediments. A species of shellfish contained 178 ppm (dry weight) in 1961, but only 7 ppm in 1970. Along these same lines, the average levels in eight species of fish fell from 23 ppm (wet weight) in 1961 to only 0.2 ppm in 1970. Whereas the sediments contained as high as 100 ppm at some locations (Goldberg, et al, 1951). It has also been stated that as much as 99 percent of the mercury found in fish is scavenged from water (Jernelov, et al, 1971). Studies conducted with other species and heavy metals have shown, for the most part that the metals are more easily absorbed in solution (Goldberg, et al, 1951; Korringa, 1952; Pentreath, 1973; Eisler, et al, 1972; Renfrou, et al, 1975).

Even though metals may not move up the food web, organisms may be directly impacted from metals in solution or sediments. Research to date seems to indicate that there should not be a significant impact on the marine ecosystem. The reasons being:

1. There is little release of metals from dredged materials and what little is released would be quickly diluted to background levels (Chen, et al, 1978; EPA, n.d.; Neff, et al, 1978).

2. Metals that are incorporated by organisms would be depurated and/or isolated from the organisms system (Cowell, 1976; Peddicord, et al, 1978).

A second concern is whether those organisms inhabiting the disposed sediments would pick up high concentrations of metals. This was addressed in an extensive report complete with a literature review and a research program (Neff, et al, 1978). It was determined that organisms incorporate heavy metal; however, the research found that of the "Twenty exposures performed over 2 years and the resulting 136 metal-species-sediment combinations, only 49 (36 percent) demonstrated a statistically significant relationship between exposure to sediment and heavy metal concentrations in the tissues of the experimental animals. In 13 of these cases, the effect of the sediment was inverse. That is, control animals contained significantly higher metal concentrations than did the sediment-exposed animals. Thus, a significant accumulation of a metal from sediment was demonstrated only 36 times (36.5 percent)." The point was also made "In many cases where a statistically significant accumulation of a metal from a sediment was demonstrated, the uptake was quantitatively marginal and of doubtful ecological significance..."

- PCB's and DDT

As for impacts associated with PCB and DDT, it has been pointed out: "Relatively little information was available in 1970 when a number of celebrities forecasted the death of the seas as a result of environmental degradation from petroleum spillage, PCB's and DDT contamination. However, as the years have passed, examination of the marine food chain has revealed no consistency in the PCB or DDT content of organisms taken from the various trophic levels, suggesting that in these marine studies, at least, biomagnification of PCB's and DDT does not exist." (DeSanto, 1978).

- Petroleum Hydrocarbons

The impacts from petroleum spillage have been well publicized (Blumer, et al, 1970) and some authors have suggested that there could be a food chain phenomenon. But as with metals, DDT, and PCB the latest evidence disputes this (Anonymous, 1975; Cowell, 1976).

. Nitrobenzene and Naphthalene

The Corps was unable to find any public data on the toxicity of nitrobenzene. Nitrobenzene is a suspected carcinogen.

There is a substantial body of information available on naphthalene. This chemical has been found to be fairly toxic to marine organisms. For example, in a laboratory study 50 percent of a group of marine worms died in 96 hours after being subjected to 3.8 ppm of naphthalene in water. A species of shrimp was also tested; it was slightly more susceptible to this substance. The 50 percent mortality at 96 hours occurred at a concentration of 2.4 ppm.

An elutriate test conducted on the area of highest concentration at Norwalk showed a naphthalene release of 4.3 ppm and a nitrobenzene release of 750 ppm. Comparison of elutriate test results with the laboratory study of mortalities would seem to indicate that dredging the area might have a substantial impact on the harbor's ecosystem. However, the elutriate test simulates the "worst possible case" by agitating the sediments vigorously for 30 minutes. Dredging with a clamshell dredge will not cause violent agitation, and any release of chemicals should be substantially below the test results. In addition, the elutriate test does not reflect the dilution which will occur in the harbor. For this reason, it is not expected that gross mortalities would result during removal and burial of the contaminated material.

Organisms immediately below the dredging might accumulate naphthalene in their system. The obvious concern is that this accumulation could lead to the organism's death, but it has been shown that depuration is quite rapid with this chemical. In laboratory tests on animals, naphthalene was nonexistent or at very low levels from one to four days after the organisms were placed in clean water (Tatum, 1975; Anderson, 1975). It is expected that some organisms will accumulate this chemical; however, since dredging of the contaminated material should only require a few days, any adverse impact should be transitory. Handling of contaminated material will be accomplished during a period when ambient water temperature in the harbor has dropped below 42°F. Metabolic rate in most organisms is at its lowest during this time, therefore, any impact is assumed to be negligible.

IMPACTS OF DISPOSAL

Disposal of the dredged material will result in alteration of the physical substrate and the disruption of aquatic and benthic

organisms at the disposal site. Biological and physical impacts are discussed in the following paragraphs.

- Biological Impacts

In order to determine the possible adverse environmental impacts from disposing of dredged materials in ocean waters, EPA and the Corps of Engineers developed a manual for conducting bioassay tests. Bioassay tests subject sensitive marine organisms to dredged materials, and the possible contaminants they contain. There are three phases to the test -- liquid, suspended particulate, and solid. Of the three, the solid phase test is considered the most significant.

Bioassay tests were conducted on samples of material from Norwalk Harbor in 1979. Selection of sampling locations was coordinated between EPA, the Corps of Engineers, National Marine Fisheries Service, the U.S. Fish and Wildlife Service and the State of Connecticut.

The proposed oceanic discharge of dredged material from Norwalk Harbor, at the Central Long Island Sound Disposal Area is ecologically acceptable as judged by the bioassay related criteria contained in the Corps/EPA manual. Survival of the copepod (Acartia tonsa) and mysid shrimp (Neomysis americana) exposed for 96 hours to culture water control and 100 percent liquid and suspended particulate phases of four samples of dredged material was not significantly different ($P = 0.05$). Atlantic silversides (Menidia mendida) exposed to 100 percent liquid and suspended particulate phases of some samples of dredged material did exhibit significantly lower ($P = 0.05$ or 0.01) survival than control fish, but exposure-time-dependent limiting permissible concentrations (LPC's) for these phases were determined to be greater than the environmental concentrations of the phase after initial mixing. In addition, total (combined) survival of the mysid shrimp (N. americana), hard clam (Mercenaria mercenaria), and sandworm (Nereis virens) exposed for 10 days to control (culture) sediment, reference (disposal-site) sediment, and the solid phase of the four samples of dredged material was not significantly different ($P = 0.05$).

- Physical Impacts

The sediment disposed from Norwalk Harbor will form a mound on this ocean floor at the disposal site. The sediment to be removed from Norwalk Harbor is primarily plastic, organic silt and clay. The sediment bears a resemblance to both Stamford and New Haven Harbors, at which successful point-dumping and capping has

been achieved, in terms of size, distribution and behavioral physical properties (Atterberg limits). Figure 5 shows composite mechanical analyses compiled to represent numerous samples from Norwalk, Stamford and New Haven Harbors. They demonstrate the close similarity of the fine grained materials from each on a size distribution basis (see Figure 6).

ALTERNATIVES TO THE PROPOSED ACTION

In developing a proposal for the maintenance dredging of Norwalk Harbor, a number of alternatives were considered. These include: land based disposal; island creation; open water disposal; and no dredging. Consideration of the options available lead to the conclusion that the project as proposed represents the most viable approach from an economic, operational and environmental standpoint.

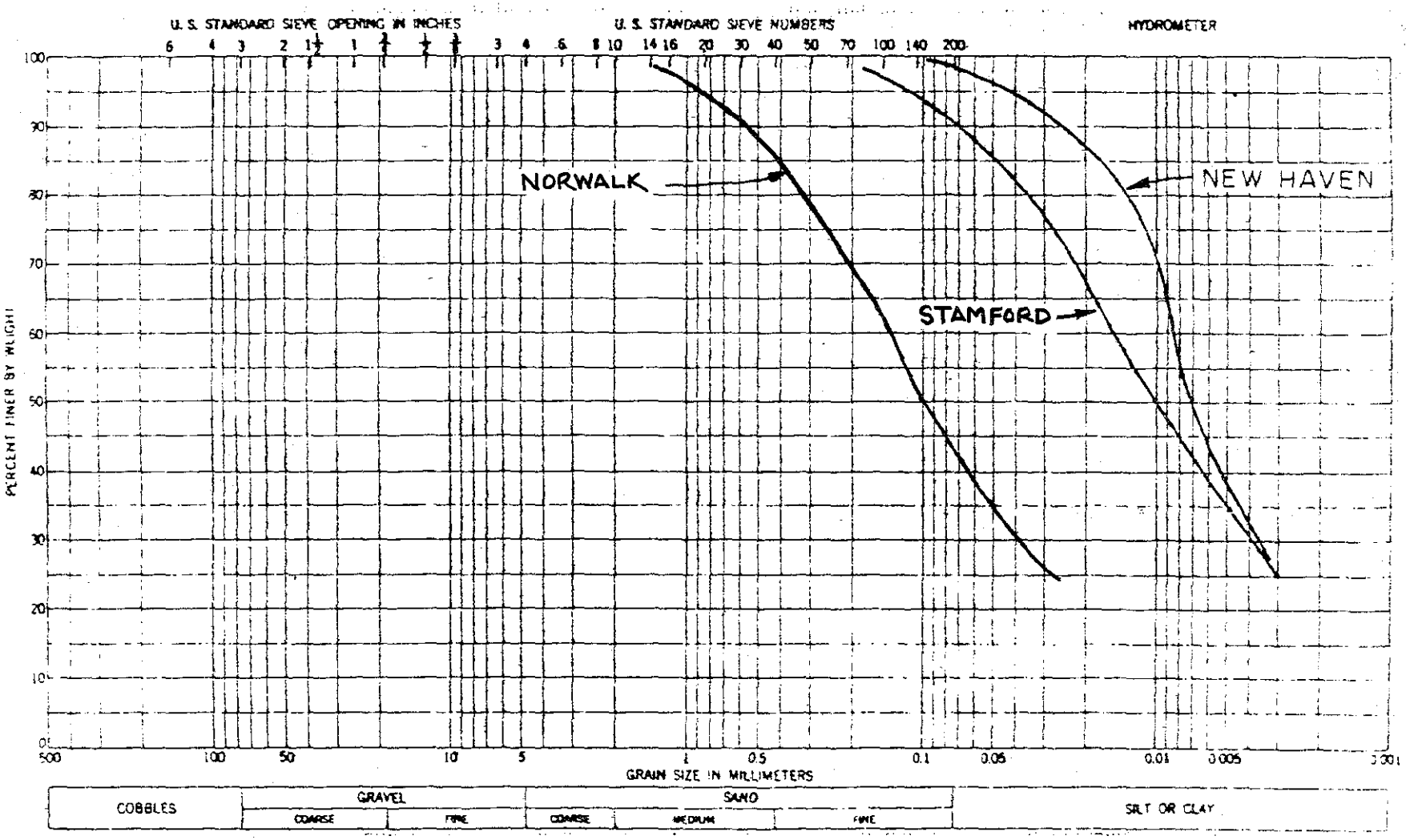
Land Disposal

Nine potential land based sites were evaluated within the immediate geographic area of Norwalk Harbor. The evaluation was limited to those sites within a two mile pumping distance and with an elevation no greater than 50 feet above the harbor due to engineering constraints. Further criteria were that the sites must not be actively used for residential, commercial, industrial, recreational, or burial purposes, for the obvious reason that economic and institutional constraints would render use of such areas unfeasible. Location of the nine sites is displayed in Figure 7. None of these sites are acceptable for dredge spoil disposal.

Sites one through three are tidal wetlands; a diminishing resource in the Norwalk area. All three sites would require extensive diking systems; furthermore, it would be impossible to lay a pipeline to these areas. For these reasons, the sites were rejected.

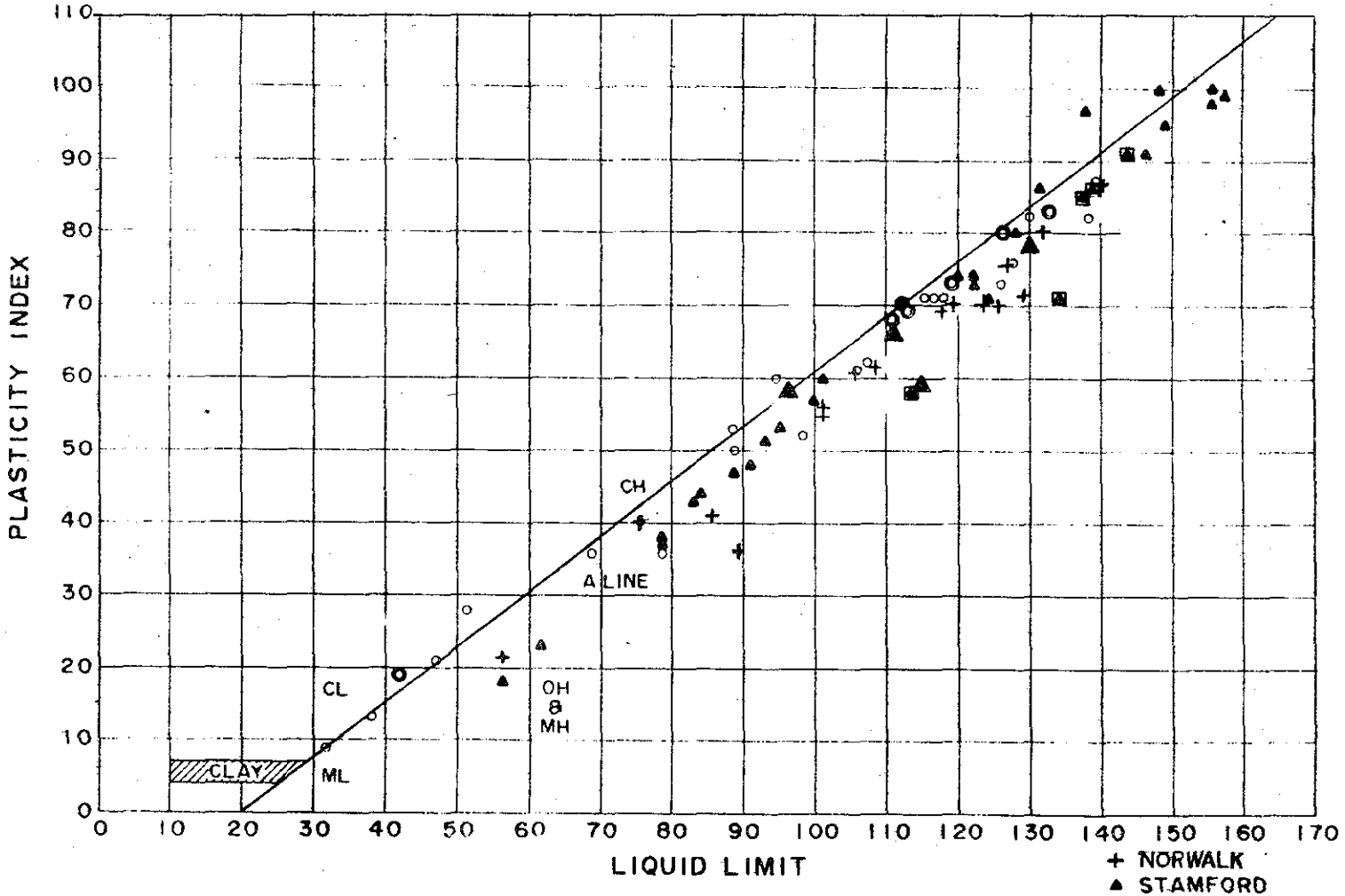
Site four is a 30 acre tidal mudflat. As with the previous sites, this type of area is a diminishing resource and the U.S. Fish and Wildlife Service has expressed a desire to retain such areas. Finally, extensive bulkheading on three sides of the site would be required; this would raise the cost substantially while providing very little benefit.

Site five is a small, previously filled area. This property has been optioned by a developer who plans to erect an office complex on the site. Disposal on this site would preclude use of the area for years. Consequently, the owner would not allow the



COMPOSITE MADE FROM 1st, 2nd & 3rd QUARTILES & % FINES AVERAGED FROM GRAIN SIZE ANALYSES OF STAMFORD AND NEW HAVEN SAMPLES

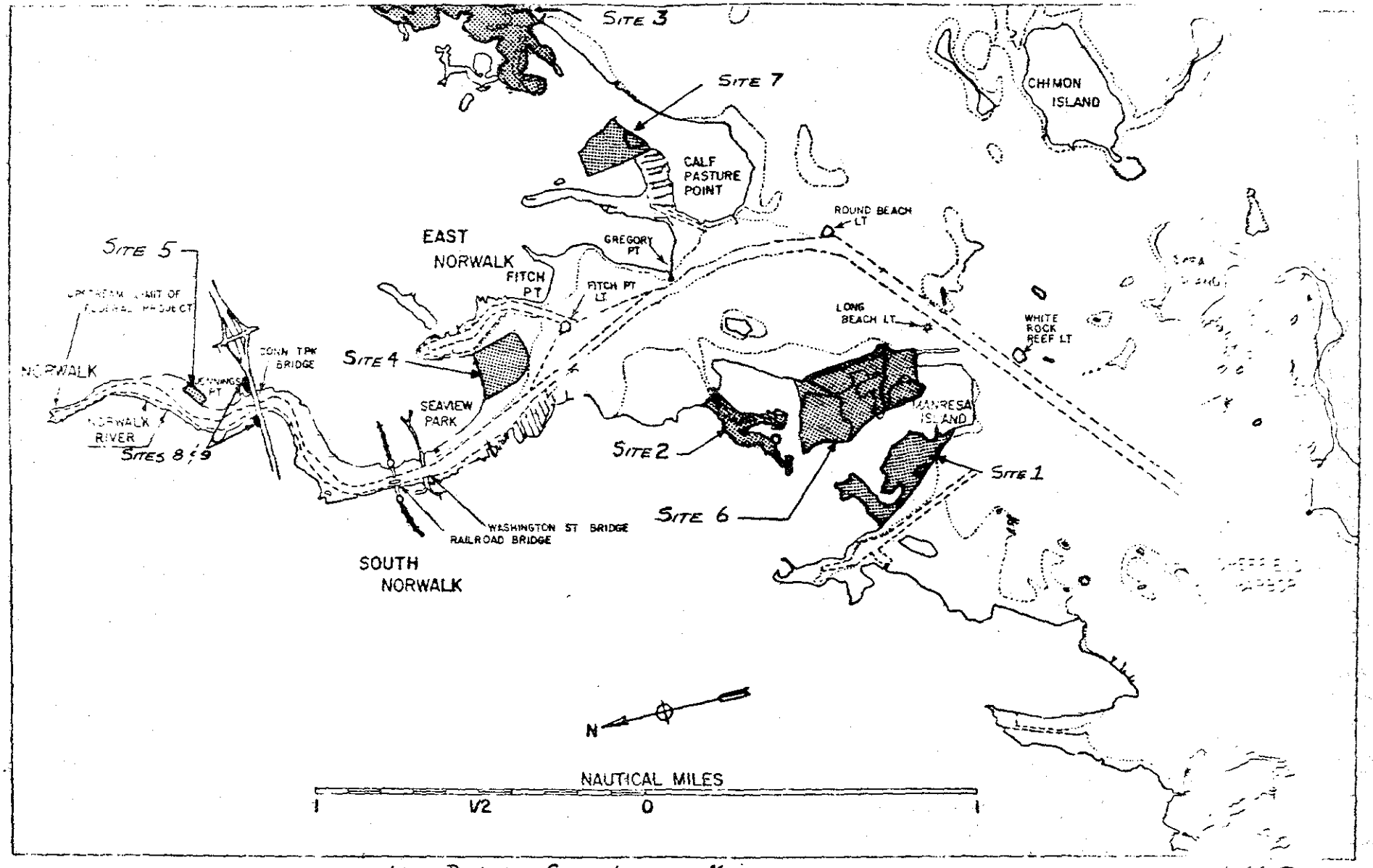
FIGURE 5



PLASTICITY CHART

+ NORWALK
▲ STAMFORD
⊙ NEW HAVEN
▲ STAMFORD ENTRANCE CHANNEL
▣ STAMFORD WEST BRANCH
⊙ NEW HAVEN WITHIN PROPOSED AREA FOR DREDGE MATERIAL

FIGURE 6



LAND DISPOSAL SITE LOCATION MAP

area to be used as a disposal site.

Site six is also a landfill site. Connecticut Light and Power Company owns the property and intends to use the area for future plant expansion or as a storage area for coal. The company is unwilling to relinquish their rights to this property.

Site seven is owned by the city of Norwalk, and is used as a recreational area. The city does not want to limit the use of this open space by using it as a disposal site.

Sites eight and nine have a combined area of less than an acre and would contain only about 10,000 cubic yards of sediment.

Long Island Sound Island Creation Study

The New England Division has initiated a study to determine the feasibility of creating islands within Long Island Sound with materials dredged from Connecticut rivers and harbors. Consideration will also be given to suitable materials other than dredged material.

Authority to conduct the study is contained in a Resolution of the Committee on Public Works and Transportation, U.S. House of Representatives, sponsored jointly by Congressmen Robert N. Giaimo, Stewart B. McKinney, and Christopher O. Dodd, and adopted 10 May 1977.

The study will take four years to complete at a total estimated cost of $1.2 million. Fifty thousand dollars was allocated for Fiscal Year 1978 to begin Stage 1 of the three stage planning effort. Stage 1 involves a study of the economic feasibility and the environmental, social, cultural, political, institutional and aesthetic acceptability of creating islands by means of containerization or extension of shorefront areas of Long Island Sound with dredged materials from various coastal projects. While island creation may be a possible option for the disposal of dredged material in Long Island Sound in the future, it is not presently an available alternative.

Open Water Disposal

Disposal of dredged material into the waters of the United States is governed by the provisions of Section 404(b) of the Clean Water Act of 1977 (P.L. 92-500, as amended). All disposal sites within Long Island Sound come within the purview of this Act. Section 404(b)(1) provides that the EPA promulgate guidelines governing disposal of dredged and fill material. These

guidelines are comprehensive and are published in 40 Code of Federal Regulations, part 230.

There are 19 previously used disposal sites within the Long Island Sound area. In accordance with Corps-EPA policy, no new disposal sites will be considered except under unusual circumstances or when and where practical to reduce the number of existing disposal sites. Based on this philosophy, the Long Island Sound sites have been reduced to four interim sites. Three of these sites, New London, Cornfield Shoal and the New Haven or Central Long Island Sound site are active. The fourth site, which is proposed for the western portion of the Sound, has yet to be designated. Among others, the historic Eaton's Neck dump grounds, Cable and Anchor Reef, and the Compass Rose site are being studied by the New England Division for possible designation.

The New Haven disposal site was selected because it is currently the only State approved aquatic disposal site in either Central or Western Long Island Sound. The site has been the subject of extensive monitoring and substantial data base exists with which to measure and predict potential environmental impacts.

No Action

The "no dredging" alternative would allow the current severely shoaled situation to continue unabated and would lead to even more hazardous conditions than presently exist in the harbor. Lack of maintenance would also have a detrimental impact on the waterborne economics of the harbor and a detrimental impact on fuel conservation. Shifting transport of petroleum from barges to trucks at Norwalk Harbor would result in additional diesel fuel usage of about 33,500 gallons per year. Transport of stone and sand into Norwalk by truck instead of barge would result in use of an additional 102,900 gallons of diesel fuel per year. Assuming the price of diesel fuel to be $.75 per gallon, movement of materials presently being barged into Norwalk by truck would cost an additional $190,800 per year.

COORDINATION WITH OTHERS

This project is being planned by the Corps of Engineers in cooperation with other Federal, State and local concerns. Coordination will include a public meeting as well as further verbal and written communication. A determination of the need for monitoring will be made as part of the continual dialogue between agencies as the project proceeds.

Public notices were issued on 27 April and 21 September 1979

describing the proposed plan of action. Public comments were solicited in both of these notices. Opportunity for public comment will also occur at a public hearing to be held on 29 October 1979 in Norwalk, Connecticut.

REFERENCES

1. Wakeman, T.H., Sustar, J.F., and Dickson, W. 1973. "Alternative Dredging -- Relative Physical Impact," San Francisco District, Corps of Engineers.

2. Barnard, W.D. 1978. Prediction and Control of Dredged Material Dispersion Around Dredging and Open Water Pipeline Disposal Operations. Technical Report DS-78-13, U.S. Army Engineers Waterways Experiment Station, CE, Vicksburg, Miss.

3. Bobuniewicz et al. 1974. Fall River EIS.

4. Lunz, G.R., Jr. 1938. Part I - Oyster Culture with Reference to Dredging Operations in South Carolina. Rept. to U.S. Army Engineers District, Charleston, CE, Charleston, S.C.

5. Wilson, W. 1950. The Effects of Sedimentation Due to Dredging Operations on Oysters in Capano Bay, Texas. M.S. Thesis. Texas A&M, College Station, Tex.

6. Ingle, R.M. 1952. Studies on the Effect of Dredging Operations Upon Fish and Shellfish, Tech. Ser. No. 5. State of Florida, Board of Conservation, Tallahassee, Fla.

7. Mackin, J.G. 1956. Studies on the Effect of Suspensions of Mud in Seawater on Oysters. Rpt. No. 19. Texas A&M Research Foundation Project 23, College Station, Tex.

8. Mackin, J.G. 1962. Canal Dredging and Silting in Louisiana Bays. Pubs. Inst. Mar. Sci., Univ. Tex. 7:262-314.

9. Loosanoff, V.L. 1961. Effects of Turbidity on Some Larval and Adult Bivalves. Proc. Gulf Caribb. Fish. Inst. 14, 80-95.

10. Loosanoff, V.L. 1965. The American or Eastern Oyster. Circ. Bur. Coml Fish., Wash., 205, 1-36.

11. Environmental Protection Agency, U.S., "Biological Damage Assessment of Norwalk River, Connecticut," unpublished report prepared by the Water Science Branch, Cincinnati Field Investigation Center, Office of Enforcement and General Counsel, EPA, Cincinnati, OH.

12. Peddicord, R.K. and McFarland, J.A. 1978. Effects of Suspended Dredged Material on Aquatic Animals. Technical Report

D-78-29. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

13. Neff, J.W., Foster, R.S., Slowey, J.F. 1978. Availability of Sediment -- Adsorbed Heavy Metals to Benthos with Particular Emphasis on Deposit-Feeding Infauna. Technical Report D-78-42. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

14. Cross, F.A., Hardy, L.H., Jones, N.Y., and Barber, R. 1973. Fish, J. Res. BI Can. 30, 1287-1291.

15. Knauer, G.A. and Martin, J.H. 1972. Linorol. Oceanogr. 17, 868-876.

16. Cocores, G., Cohn, P.M., and Siler, W. 1973. Fish, J. Biol. 5, 641-647.

17. Sutherland, J.M., Burton, J.D., Calkin, F., McCartney, M.J., Morris, R.J. 1973. Deep-Sea Res. 20, 679-685.

18. Williams, P.M. and Weiss, H.V. 1973. Fish, J. Res. Bd. Can. 30, 293-295.

19. Hannerz, L. 1968. Rep. Inst. Fresh Wat. Res. Drottningholm 48, 120-176.

20. Laumond, F., Neuburger, M., Donnier, B., Fourcy, A., Hel, R.B., and Aubert, M. 1973. Rev. Intern. Oceanogr. Med 31-32, 47-53.

21. Jernelov, A. and Hifann. 1971. Mercury Accumulation Food Chains. Okios, 22:403-405.

22. Aubert, M., Hel, R.B., Laumond, F., Romeo, M., Donnier, B., Barelli, M. 1973. Utilization of a Pelagic Trophodynamic Chain for the Study of Metal Pollutant Transfers. Rev. Intern. Oceanogr. Med. Tome XXVIII.

23. Stickel, W.H. 1974. Some Effects of Pollutants in Terrestrial Ecosystems, in Ecological Toxicology Research (eds) McIntyre, A.D and Mills, C.F. Plenum Press, p.63.

24. Goldberg, E.D., McBlair, W., and Taylor, K. 1951. Biol. Bull. Mar. Biol. Lab. Woods Hole 101, 84-94.

25. Korringa, P. 1952. Quart. Rev. Biol. 27, 266-308.

26. Pentreath, R.J. 1973. J. Mar. Biol. Ass. U. K. 53, 127-145.

27. Eisler, R., Zaroogian, G.E., and Hennekey, R.J. 1972. Fish, J., Res. Bd. Cara. 29: 1367-1369.

28. Renfro, W.C., Fowler, W.C., Heyraud, M., and LaRosa, J. 1975. Fish, J. Res. Bd. Cana. 32: 1339-1345.

29. Aston, S.R. and Chester, R. 1976. In Estuarine Chemistry (eds) Buton, J.D. and Liss, P.S. Academic Press. p.40.

30. Oviatt -- Portland.

31. Windom, H.L. 1973. In Estuarine Research (ed) Cronin, L.E. Academic Press, Inc. Vol II, p. 561.

32. Neff, J.W., Foster, S. and Slowey, F. 1978. Tech. Rep. D-78-42. Office, Chief of Engineers, U.S. Army, Wash. D.C. pp 1-281. p.204 & 205.

33. Tatem, H.E. The Toxicity and Physiological Effects of Oil and Petroleum Hydrocarbons on Estuarine Grass Shrimp, Palaemonites pugio. Holthuis. Ph D. Dissertation, Texas A&M University, College Sta. Texas, 133 pp. 1975.

34. Anderson, J.W., Laboratory Studies on the Effects of Oil on Marine Organisms: An Overview, American Petroleum Institute Pub. No. 4249, 70 pp., 1975.

35. DeSanto, R.S. 1978. Concepts of Applied Ecology. Springer-Verlag. p.185.

36. Blumer, M., Sass, J., Sanza, G., Sanders, H.L., Grasola, J.F., and Hampson, G.R. 1970. The West Falmouth Oil Spill. Tech. Rep. W.H.O.I. Ref. No. 70-44.

37. Anonymous. 1975. Petroleum in the Marine Environment, National Academy of Sciences. p.66.

38. Cowell, E.B. 1976. Oil Pollution of the Sea. in Marine Pollution (ed) R. Johnston Academic Press p.390.

39. Chen, K.Y., Yu, K.Y., Morrison, R.D., and Mang, J.L. 1978. Physical and Chemical Characteristics of Dredged Material Sediments and Leachates in Confined Land Disposal Areas. Technical Report D-78-43, U.S. Army Engineers Waterways Experiment Sta., CE, Vicksburg, Miss.

Section 404(b) Evaluation
for
Maintenance Dredging of Norwalk Harbor
Norwalk, Connecticut

References.

a. Section 404(b) of Public Law 92-500, Federal Water Pollution Control Act

b. 40 CFR 230.4 - 230.5 dated 5 September 1975

c. EC 1105-2-90 Appendix C, dated 8 May 1979

The Proposed Project

The proposed project calls for maintenance dredging of the Federal channel at Norwalk Harbor to restore the channel to its authorized dimensions. This action will involve the removal of approximately 300,000 c.y. of shoal material by clamshell dredge with disposal at a specified point within the Central Long Island Sound Disposal Area. Approximately 4% of the material to be dredged falls into Class III category of the New York - Connecticut Interim Plans for Disposal of Dredged Material in Long Island Sound. This material will be covered or "capped" with cleaner sediments from Norwalk Harbor.

Additionally, approximately 2000 c.y. of sediments contaminated with naphthaline and nitrobenzene will be dredged. This material will be placed in a deep excavation beneath the Federal Channel and covered with at least 5 feet of overburden. This will isolate these chemicals from the ecosystem and also keep the material under the Corps' jurisdiction.

Project Authorization

The Federal navigation project at Norwalk Harbor, Connecticut was authorized under the River and Harbor Act, of 1919 and modified in 1945.

Environmental Concerns

Four major areas of concern have been identified in conjunction with the proposed dredging of Norwalk Harbor. These are:

(1) the impacts of suspended materials on estuarine biota
(2) the uptake of contaminants at the dredge and disposal site
(3) the impact of dredging and disposal of sediments containing nitrobenzene and naphthalene
(4) the impacts of disposal in Long Island Sound.

In-depth discussions on each of these topics can be found in the Environmental Assessment for Maintenance Dredging of Norwalk Harbor, Norwalk, Connecticut, October 1979, prepared by the New England Division, Army Corps of Engineers.

Technical Evaluation

A technical evaluation with respect to disposal of dredged material and potential environmental impacts resulting from such disposal has been completed. The results are presented on page 4. Concomitant reading of or adequate familiarity with Section 404(b) Guidelines will insure understanding of results presented in the technical evaluation.

Conclusions

Determinations

a. An ecological evaluation has been made following the evaluation guidance in 40 CFR 230.4, in conjunction with the evaluation considerations in 40 CFR 230.5.

b. Appropriate measures have been identified and incorporated in the proposed plan to minimize adverse effects on the aquatic environment as a result of the discharge (See Environmental Assessment for Maintenance Dredging of Norwalk Harbor, Norwalk, Connecticut, October, 1979).

c. Consideration has been given to the need for the proposed activity, the availability of alternate sites and methods of disposal that are less damaging to the environment, and such water quality standards as are appropriate and applicable by law.

d. Discharge of dredged material into wetlands will not occur. The proposed disposal site for dredged material from Norwalk Harbor is the Central Long Island Sound Disposal Area, an open water site.

Findings.

The discharge site for the maintenance dredging of Norwalk Harbor, Norwalk, Connecticut, has been specified through the application of the Section 404(b)(1) Guidelines.

The project files and Federal regulations were reviewed to properly evaluate the objectives of Section 404 of Public Law 92-500. A public notice with respect to the 404 Evaluation and Environmental Assessment was issued on September 28, 1979. Based on the information presented in both the Technical Evaluation and Environmental Assessment, and in light of the economic need to maintain Norwalk Harbor, I find that the project will not result in unacceptable adverse impacts to the environment.

5 Oct 1979
Date

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Technical Evaluation

230.4-1 Physical and Chemical - Biological Interactive Effects.

(a) Physical Effects (1 through 3)

(1) Effects on Wetlands

Dredging is expected to result in some siltation along adjacent shorelines as fine grained sediments settle out of the water column. This is expected to be temporary and may not be significantly greater than the ambient estuarine conditions found at Norwalk Harbor.

(2) Effects on the Water Column

Both dredging and disposal will result in increased turbidity, a reduction in light transmission and release of offensive gases and toxic chemicals that may cause direct destruction of nektonic and planktonic populations. These conditions are expected to be temporary and should dissipate once dredge/disposal operations are completed.

(3) Effects on Benthos

Dredging will destroy any benthic populations inhabiting the immediate work area. Surrounding communities may be stressed by siltation. Scows carrying dredged material to the disposal site will be required to leave the harbor area through the approach channel of the Federal navigation project. This will preclude the possibility of inadvertant loss of dredged material in commercial oyster beds.

(b) Chemical - Biological Interactive Effects (1 through 3).

(1) Dredged material from Norwalk Harbor would not meet specifications outlined in paragraphs (b)(1)(i)(ii) or (iii) of this section. Consequently, evaluation procedures specified in paragraphs (b)(2) and (3) must be addressed.

(i) Dredged material would be predominantly organic silts and some sand as opposed to larger particle size sedimentary material.

(ii) Dredged material is not suitable for beach nourishment or restoration.

(iii) (a) Dredged material from Norwalk is substantially the same as the substrate found at the Central Long Island Sound Disposal Area. (See Environmental Assessment, Norwalk Harbor, Connecticut, October 1979.

(b) The proposed dredge site cannot be considered sufficiently removed from sources of pollution to provide reasonable assurance that the material has not been contaminated.

(c) Adequate terms will be imposed on the discharge of dredged material to insure the operation proceeds in a manner that will be least damaging to the environment outside the disposal site.

(2) Water Column Effects

Release of heavy metals and other pollutants into the water column is exected to occur during both dredging and disposal operations. The degree to which these pollutants become soluable depends, in part, on the chemical form or species present in the sediments. It is felt that with normal turbid conditions common in estuarine environments and tidal flushing to dilute any contaminants that may be released, any affects to the water column will be minimal and temporary.

(3) Effects on Benthos.

Bioassays were used to indicate possible impacts on benthic organisms. Results of these tests are included and discussed in the Environmental Assessment prepared on the proposed project. Results of the bioassay show no significant difference in survival for the three species tested in dredged and reference sediments, thus indicating the material is ecologically acceptable for oceanic discharge.

230.4-1 (c) Procedure for Comparison of Sites (1 and 2)

(1) Elutriate tests using Norwalk Harbor sediments were conducted in March 1979 by the New England Division Corps of Engineers, and in 1976 by the Environmental Protection Agency. Results of these tests are discussed in the Environmental Asessment prepared for this project.

(2) Analysis of biological community structure at the proposed disposal site was accomplished as part of the extensive monitoring program developed for the Stamford/New Haven maintenance dredging project.

230.4-2 Water Quality Considerations

The proposed discharge will not violate any appropriate or legally applicable standards.

230.5 Selection of Disposal Sites and Conditioning of Discharges of Dredged or Fill Material (a through e).

(a) General Considerations and Objectives (1 through 8).

(1) Discharge activities should not significantly disrupt the chemical, physical or biological integrity of the aquatic ecosystem (See Environmental Assessment Norwalk Harbor, October 1979).

(2) Discharge activities should not significantly disrupt the food chain or result in an alteration or decrease in diversity of plant or animal species.

(3) Discharge activities will be scheduled to avoid inhibiting faunal movement into and out of breeding, spawning or nursery areas.

(4) Discharge activities will not affect any wetlands.

(5) Discharge activities will not destroy or isolate areas that serve the function of retaining natural high or flood waters.

(6) Discharge activities will temporarily increase turbidity levels at the disposal site. Ambient conditions should return shortly after disposal activities are completed.

(7) Discharge activities will temporarily reduce aesthetic values at the disposal site. Recreational and economic values are not expected to be either enhanced or reduced at the disposal site.

(8) Degradation of water quality will be avoided through application of Sections 230.4, 230.5 (c) and (d).

230.5(b) Considerations Relating to Degradation of Water Uses at Proposed Disposal Sites (1 through 10).

(1) Not applicable. No municipal water supply intakes are located in or near the proposed disposal site.

(2) Shellfish (i through iv)

(i) The disposal site is not designated as an area of high shellfish concentration .

(ii) The disposal site is located far enough away from potentially productive shellfish beds (2-5 miles) that movement of pollutants by currents or wave action would be insignificant.

(iii) Dredged material would not create any topographic anomalies that would result in undesirable changes to current patterns, salinity patterns or flushing rates that would affect shellfish.

(iv) Disposal operations will be scheduled to avoid interference with reproductive processes and avoid undue stress to juvenile forms of shellfish.

(3) Fisheries (i through iii).

(i) No significant disruption of fish spawning or nursery areas is expected as a result of the proposed discharge.

(ii) Dredging and disposal schedules will be coordinated with appropriate Federal and State agencies to insure minimal interference with fish spawning cycles and migration patterns or routes.

(iii) There is no significant submersed or emergent vegetation at the disposal site.

(4) Wildlife

There should be no significant disruption to wildlife habitat, food chains or community structure as a result of the proposed discharge. The disposal site is not designated as, or adjacent to designated marine or aquatic sanctuaries.

(5) Recreational Activities (i through iv)

(i) Reasonable methods will be employed to minimize any increased duration of turbidity which would reduce the numbers and diversity of fish, or cause a significant aesthetically displeasing change in the color, taste or odor of the water.

(ii) Disposal operations should not result in eutrophication, or impair recreational values. Aesthetic values will be temporarily reduced as a result of the discharge.

(iii) Discharge of dredged material will not result in unacceptable levels of pathogenic organisms in areas used for recreational purposes.

(iv) Dredged material does not contain harmful quantities of oil or grease as defined in 40 CFR 110.

(6) Threatened and Endangered Species

The proposed discharge will not jeopardize the continued existence of any threatened or endangered species, or destroy or modify the habitat of those species determined critical in accordance with the Endangered Species Act.

(7) Benthic Life

The proposed disposal site is an established and active dump site.

Benthic organisms inhabiting the immediate area would be destroyed during disposal. Repopulation should commence shortly after disposal is completed, with neighboring communities releasing larva that might settle on the disposed material.

(8) Wetlands (i and ii)

(i) Not applicable. There will be no disposal of dredged material in wetlands.

(ii) Not applicable. The proposed project does not involve discharge of fill material.

(9) Submersed Vegetation

There is no significant submersed vegetation in or adjacent to the disposal site.

(10) Size of Disposal Site

The established Central Long Island Sound Disposal Area is approximately one nautical mile long and one nautical mile wide. Dredged material will be point dumped at a buoy located at 41°08'50"N, 72°53'25"W. Disposal operations will be controlled by Federal inspectors using precision navigation.

230.5(c) Other Considerations Concerning Determination of Disposal Site and Disposal Conditions (1 through 7)

(1) Appropriate scientific literature has been incorporated in the project design and the Norwalk Harbor Maintenance Dredging Environmental Assessment prepared by the Corps of Engineers, NED, October 1979. This technical evaluation is based on findings and recommendations presented in the Environmental Assessment for Norwalk Harbor.

(2) Alternatives to open water disposal were considered during plan formulation. (See Environmental Assessment, Norwalk Harbor, Connecticut, October 1979) All alternatives were found to be either environmentally undesirable or economically unjustifiable.

(3) The proposed disposal site has been identified as a "containment" site by the States of Connecticut and New York. After discharge, dredged material will be subject to some degree of erosion and suspension by natural tidal and non-tidal currents found at the disposal site.

(4) Disposal seaward of the baseline of the territorial seas is economically unjustifiable and may not be environmentally acceptable.

(5) Sediment analysis has shown approximately 4% of the Norwalk Harbor sediments to require "capping" with cleaner sediments. These Class III sediments will be dredged and disposed of in a manner that will result in being covered with material from less polluted areas of the harbor.

(6) Not applicable. Disposal operations will not occur in a confined area.

230.5(d) Contaminated Fill Material Restrictions

Not applicable. The discharge of fill material will not occur in conjunction with the proposed project.

230.5(e) Mixing Zone Determination (1 through 6)

(1) The Central Long Island Sound Disposal Area is approximately one nautical mile long and one nautical mile wide. The site is located at approximately the 60 foot contour line and is more than large enough to receive the estimated 300,000 c.y. of sediments from Norwalk Harbor.

(2) Studies done at the Central Long Island Sound Disposal Area show the presence of a rotary current. Some portion of the dredged material will be subject to dispersion by these currents.

(3) Considerable turbidity is found throughout this area of Long Island Sound. Disposal activities will temporarily increase turbidity levels.

(4) Stratification of dredged material is not expected to occur during discharge except where the intent is to "cap" highly polluted sediments will cleaner material.

(5) On-site studies of the disposal site have been conducted by Yale University. Results suggest the disposal site would be suitable for the deposition and containment of silt. Recommendations in regards to future use of this site include further indepth studies on siltation/sediment transport.

(6) Correlation of turbidity and wind velocity data indicates that only major windstorms would exert much effect on the bottom of the disposal site.